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(54) **Abrasive-containing, built liquid detergent composition.**

(57) Liquid detergent compositions containing a high-sudsing surfactant, a detergency builder and an abrasive are disclosed. The compositions provide easier and faster cleaning of food soils from kitchenware in hand dishwashing operations.

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ABRASIVE-CONTAINING, BUILT LIQUID DETERGENT COMPOSITION

Background

The invention relates to liquid detergent compositions containing specified amounts and types of insoluble abrasives which are especially useful in the washing of dishes. The compositions also contain high-sudsing surfactants and detergency builders which complement the action of the abrasive.

The use of abrasives in powdered scouring cleansers is well known. Scouring cleansers generally contain a relatively high level of abrasive. When used in the dishwashing process such products provide abrading power to make the removal of cooked, burnt or dried-on foods on kitchenware easier and more convenient. More recently, liquid scouring cleansers containing water-insoluble abrasives have become available. Such liquid compositions are disclosed in U.S. Patents 3,149,078; 3,210,285; 3,210,286; 3,214,380; 3,579,456; 3,623,990; 3,677,954; 3,813,349 and 3,966,432. The use of scouring cleansers, however, is normally in addition to a specific dishwashing product one product being required for removal of non-sticking soils, especially fats and oils, and a second product being required for scouring purposes.

It is an object of the present invention to provide liquid dishwashing compositions containing a high-sudsing surfactant, a detergency builder and an abrasive, the combination being highly effective in removing food soils from kitchenware when used undiluted or in the form of a relatively concentrated water solution, but which is acceptable for hand dishwashing in the dilute water solutions typically used with liquid dishwashing products.

Summary of the Invention

The present invention provides a liquid detergent composition containing by weight

a) from about 15% to about 50% of a high sudsing surfactant selected from the group consisting of anionic, nonionic, ampholytic and zwitterionic surfactants and mixtures thereof.

b) from about 3% to about 20% of a detergency builder selected from the group consisting of water-soluble polyphosphates, water-soluble organic carboxylates; water-soluble phosphonates; alkali metal silicates; alkali metal carbonates; water-insoluble crystalline aluminosilicate ion exchange material of the formula:

$$Na_z[(AlO_2)_z \cdot (SiO_2)_y] \cdot xH_2O$$

wherein z and y are at least 6, the molar ratio of z to y is from 1.0 to 0.5 and x is from 10 to 264, said material having a particle size diameter of from about 0.1 micron to about 10 microns, a calcium ion exchange capacity of at least about 200 mg. $CaCO_3$ eq./gram and a calcium ion exchange rate of at least about 2 grains Ca^{++}/gallon/minute/gram; water-insoluble amorphous hydrated aluminosilicate material of the empirical formula:

$$M_z(zAlO_2 \cdot ySiO_2)$$

wherein M is sodium, potassium, ammonium, or substituted ammonium, z is from about 0.5 to about 2, y is 1 and said material having a particle size diameter of less than 100 microns, a magnesium ion exchange capacity of at least about 50 milligrams equivalent of $CaCO_3$ hardness per gram of anhydrous aluminosilicate and a Mg^{++} exchange rate of at least about 1 grain/gallon/minute/gram/gallon; and mixtures thereof.

c) from about 3% to about 20% of a water-insoluble abrasive having a particle diameter of from about 1 to about 150 microns and a hardness on the Mohs scale of from about 2 to about 7; and

d) the balance water;

said compositions providing an initial suds cover to a dishwashing solution and a suds cover after the washing of 8 plates when used at a concentration of 0.07% in 2 gallons of 115°F. water containing 7 grains/gallon water hardness measured as $CaCO_3$, each plate carrying 4.0 ml. of a triglyceride containing soil.

Detailed Description of the Invention

The detergent compositions of the present invention contain four essential components:

a) a high sudsing surfactant

b) a detergency builder

c) a water-insoluble abrasive

d) water.

Optional ingredients can be added to provide various performance and aesthetic characteristics.

Surfactant

The compositions of this invention contain from about 15% to about 50% of a surfactant selected from the group consisting of anionic, nonionic, ampholytic, zwitterionic surface active agents and mixtures thereof. Preferred compositions contain from about 25% to about 35% of surfactant by weight of the composition. Especially preferred are anionic surfactants and mixtures of anionic and nonionic surfactants.

Many anionic detergents can be broadly described as the water-soluble salts, particularly the alkali metal, ammonium and amine salts, of organic sulfuric reaction products having in their molecular structure an alkyl radical containing from about 8 to about 22 carbon atoms and a radical selected from the group consisting of

sulfonic acid and sulfuric acid ester radicals. Included in the term alkyl is the alkyl portion of high acyl radicals. Examples of the anionic synthetic detergents which can form the surfactant component of the compositions of the present invention are the sodium or potassium alkyl sulfates, especially those obtained by sulfating the higher alcohols (C_8-C_{18} carbon atoms) produced by reducing the glycerides of tallow or coconut oil; sodium or potassium alkyl benzene or toluene sulfonates, in which the alkyl group contains from about 9 to about 15 carbon atoms, (the alkyl radical can be a straight or branched aliphatic chain); sodium or potassium paraffin sulfonates and olefin sulfonates in which the alkyl or alkenyl group contains from about 10 to about 20 carbon atoms; sodium alkyl glyceryl ether sulfonates, especially those ethers of the higher alcohols derived from tallow and coconut oil; sodium coconut oil fatty acid monoglyceride sulfates and sulfonates; sodium or potassium salts of alkyl phenol ethylene oxide ether sulfates with about 1 to about 30 units of ethylene oxide per molecule and in which the alkyl radicals contain from 8 to about 12 carbon atoms; the reaction products of fatty acids esterified with isethionic acid and neutralized with sodium hydroxide where, for example, the fatty acids are derived from coconut oil; sodium or potassium salts of fatty acid amides of a methyl tauride in which the fatty acids, for example, are derived from coconut oil and sodium or potassium β-acetoxy- or β-acetamido-alkanesulfonates where the alkane has from 8 to 22 carbon atoms.

Specific examples of alkyl sulfate salts which can be employed in the instant detergent compositions include sodium lauryl alkyl sulfate, sodium stearyl alkyl sulfate, sodium palmityl alkyl sulfate, sodium decyl sulfate, sodium myristyl alkyl sulfate, potassium lauryl alkyl sulfate, potassium stearyl alkyl sulfate, potassium decyl sulfate, potassium palmityl alkyl

sulfate, potassium myristyl alkyl sulfate, sodium dodecyl sulfate, potassium dodecyl sulfate, potassium tallow alkyl sulfate, sodium tallow alkyl sulfate, sodium coconut alkyl sulfate, potassium coconut alkyl sulfate and mixtures of these surfactants. Highly preferred alkyl sulfates are sodium coconut alkyl sulfate, potassium coconut alkyl sulfate, potassium lauryl alkyl sulfate and sodium lauryl alkyl sulfate.

Suitable alkylbenzene or alkyltoluene sulfonates include the alkali metal (lithium, sodium, potassium) and alkanolamine salts of straight-or branched-chain alkylbenzene or alkyltoluene sulfonic acids. Alkyl-benzene sulfonic acids useful as precursors for these surfactants include decyl benzene sulfonic acid, undecyl benzene sulfonic acid, dodecyl benzene sulfonic acid, tridecyl benzene sulfonic acid, tetrapropylene benzene sulfonic acid. Preferred sulfonic acids as precursors of the alkyl-benzene sulfonates useful for compositions herein are those in which the alkyl chain is linear and averages about 12 carbon atoms in length. Examples of commercially available alkyl benzene sulfonic acids useful in the present invention include Conoco SA 515, SA 597 all marketed by the Continental Oil Company and Calsoft LAS 99 marketed by the Pilot Chemical Company.

Particularly preferred anionic surfactants useful herein are alkyl ether sulfates having the formula $RO(C_2H_4O)_xSO_3M$ wherein R is alkyl or alkenyl of about 10 to about 20 carbon atoms, x is 1 to 30, and M is a water-soluble cation. The alkyl ether sulfates useful in the present invention are condensation products of ethylene oxide and monohydric alcohols having about 10 to about 20 carbon atoms. Preferably, R has 12 to 18 carton atoms. The alcohols can be derived from natural fats, e.g., coconut oil or tallow, or can be synthetic. Such alcohols are reacted with 1 to 30, and especially

1 to 12, molar proportions of ethylene oxide and the resulfing mixture of molecular species is sulfated and neutralized.

Specific examples of alkyl ether sulfates of the present invention are sodium coconut alkyl triethylene glycol ether sulfate, lithium tallow alkyl triethylene glycol ether sulfate, and sodium tallow alkyl hexaoxyethylene sulfate. Preferred alkyl ether sulfates are those comprising a mixture of individual compounds, said mixture having an average alkyl chain length of from about 12 to 16 carbon atoms and an average degree of ethoxylation of from about 1 to 12 moles of ethylene oxide.

Additional examples of anionic surfactants useful herein are the compounds which contain two anionic functional groups. These are referred to as di-anionic surfactants. Suitable dianionic surfactants are the disulfonates, disulfates, or mixtures thereof which may be represented by the following formula:

$$R(SO_3)_2M_2, R(SO_4)_2M_2, R(SO_3)(SO_4)M_2$$

where R is an acyclic aliphatic hydrocarbyl group having 15 to 20 carbon atoms and M is a water-solubilizing cation, for example, the C_{15} to C_{20} disodium 1,2-alkyldisulfates, C_{15} to C_{20} dipotassium-1,2-alkyldisulfonates or disulfates, disodium 1,9-hexadecyl disulfates, C_{15} to C_{20} disodium 1,2-alkyldisulfonates, disodium 1,9-stearyldisulfates and 6,10-octadecyldisulfates.

Nonionic surface active agents operable in the instant compositions can be any of three basic types -- the alkylene oxide condensates, the amides and the semi-polar nonionics.

The alkylene oxide condensates are broadly defined as compounds produced by the condensation of alkylene oxide groups (hydrophilic in nature) with an organic hydrophobic compound, which can be aliphatic or alkyl aromatic in nature. The length of the hydrophilic or polyoxyalkylene radical which is condensed with any

particular hydrophobic group can be readily adjusted to yield a water-soluble compound having the desired degree of balance between hydrophilic and hydrophobic elements.

Examples of such alkylene oxide condensates include:

(1) The condensation products of aliphatic alcohols with ethylene oxide. The alkyl chain of the aliphatic alcohol can either be straight or branched and generally contains from about 8 to about 22 carbon atoms. Examples of such ethoxylated alcohols include the condensation product of about 6 moles of ethylene oxide with 1 mole of tridecanol, myristyl alcohol condensed with about 10 moles of ethylene oxide per mole of myristyl alcohol, the condensation product of ethylene oxide with coconut fatty alcohol wherein the coconut alcohol is a mixture of fatty alcohols with alkyl chains varying from 10 to 14 carbon atoms and wherein the condensate contains about 6 moles of ethylene oxide per mole of alcohol, and the condensation product of about 9 moles of ethylene oxide with the above-described coconut alcohol. An example of a commercially available nonionic surfactant of this type includes Neodol 23-6.5 marketed by the Shell Chemical Company.

(2) The polyethylene oxide condensates of alkyl phenols. These compounds include the condensation products of alkyl phenols having an alkyl group containing from about 6 to 12 carbon atoms in either a straight chain or branched chain configuration, with ethylene oxide, the said ethylene oxide being present in amounts equal to 5 to 25 moles of ethylene oxide per mole of alkyl phenol. The alkyl substituent in such compounds can be derived, for example, from polymerized propylene, diisobutylene, octene, or nonene. Examples of compounds of this type include nonyl phenol condensed with about 9.5 moles of ethylene oxide per mole of nonyl phenol, dodecyl phenol condensed with about 12 moles of ethylene oxide per

mole of phenol, dinonyl phenol condensed with about 15 moles of ethylene oxide per mole of phenol, di-isooctyl-phenol condensed with about 15 moles of ethylene oxide per mole of phenol. Commercially available nonionic surfactants of this type include Igepal CO-610 marketed by the GAF Corporation; and Triton X-45, X-114, X-100 and X-102, all marketed by the Rohm and Haas Company.

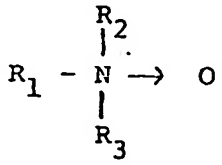
(3) The condensation products of ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol. The hydrophobic portion of these compounds has a molecular weight of from about 1500 to 1800 and of course exhibits water insolubility. The addition of polyoxyethylene moieties to this hydrophobic portion tends to increase the water-solubility of the molecule as a whole, and the liquid character of the product is retained up to the point where the polyoxyethylene content is about 50% of the total weight of the condensation product. Examples of compounds of this type include certain of the commercially available Pluronic surfactants marketed by the Wyandotte Chemicals Corporation.

(4) The condensation products of ethylene oxide with the product resulting form the reaction of propylene oxide and ethylene diamine. The hydrophobic base of these products consists of the reaction product of ethylene di-amine and excess propylene oxide, said base having a molecular weight of from about 2500 to about 3000. This base is condensed with ethylene oxide to the extent that the condensation product contains from about 40% to about 80% by weight of polyoxyethylene and has a molecular weight of from about 5,000 to about 11,000. Examples of this type of nonionic surfactant include certain of the commercially available Tetronic compounds marketed by the Wyandotte Chemicals Corporation.

Examples of the amide type of nonionic surface active agent include the ammonia, monoethanol and diethanol amides of fatty acids having an acyl moiety of from about 8 to about 18 carbon atoms. These acyl

moieties are normally derived from naturally occurring glycerides, e.g., coconut oil, palm oil, soybean oil and tallow, but can be derived synthetically, e.g., by the oxidation of petroleum, or by hydrogenation of carbon monoxide by the Fischer-Tropsch process.

Examples of the semi-polar type of nonionic surface active agents are the amine oxides, phosphine oxides and sulfoxides. These materials are described more fully in Berry, U.S. Patent 3,819,528, issued June 25, 1974, incorporated herein by reference. Particularly preferred are amine oxides of the formula:



wherein R_1 is a C_{10-18} alkyl and R_2 and R_3 are methyl or ethyl.

Ampholytic synthetic detergents can be broadly described as derivatives of aliphatic amines which contain a long chain of about 8 to 18 carbon atoms and an anionic water-solubilizing group, e.g. carboxy, sulfo or sulfato. Examples of compounds falling within this definition are sodium 3-dodecylamino-propionate, sodium-3-dodecylamino propane sulfonate, and dodecyl dimethylammonium hexanoate.

Zwitterionic surface active agents operable in the instant composition are broadly described as internally-neutralized derivatives of aliphatic quaternary ammonium and phosphonium and tertiary sulfonium compounds in which the aliphatic radical can be straight chain or branched, and wherein one of the aliphatic substituents contains from about 8 to 18 carbon atoms and one contains an anionic water solubilizing group, e.g., carboxy, sulfo, sulfato, phosphato, or phosphono.

The level and type of surfactant used in the compositions of this invention provide an initial suds cover to a dishwashing solution and a suds cover after

the washing of 8 plates when used at a concentration of 0.07% in 2 gallons of 115°F. water containing 7 grains/gallon water hardness measured as $CaCO_3$, each plate carrying 4.0 ml of a triglyceride containing soil. Suds are generated by mechanical agitation and the suds cover and height measured. A dinner plate carrying the soil is washed successively with the introduction of 4.0 ml of soil each time. An essentially complete suds cover of the washing solution is more important than suds height, but, preferably, the suds cover after the washing of 8 plates is at least about 1/2 inch in height.

The required sudsing characteristic of the compositions of the invention is that necessary to provide the user of the product with an indication of cleaning potential in a dishwashing solution. Soils encountered in dishwashing act as suds depressants and the presence or absence of suds from the surface of a dishwashing solution is a convenient guide to product usage. Mixtures of anionic surfactants and nonionic surfactants, especially amides and amine oxide nonionic surfactants, are particularly preferred in the compositions of the invention because of their high sudsing characteristics, their suds stability in the presence of food soils and their ability to indicate accurately an adequate level of product usage in the presence of soil. A preferred ratio of anionic surfactants to nonionic surfactants is from about 2:1 to about 10:1 by weight.

Cationic surfactants such as quaternary ammonium compounds can find optional use in the practice of the invention, particularly in compositions containing nonionic surfactants.

ABRASIVE

The abrasive agent can be any of the water-insoluble abrasive materials known in the art which have a particle diameter of from about 1 to about 150, preferably from

about 20 to about 100, microns and a hardness on the Mohs scale of from about 2 to about 7. Included are materials such as agate, mica, calcite, garnet, quartz, kieselguhr, silica, marble, tripoli, flint, feldspar, emery, pumice, alumina, perlite, expanded perlite, volcanic ash, diatomaceous earth, bentonite, amorphous silica from dehydrated silica gels, precipitated silica, plastics such as polystyrene and polyacrylates, and natural and synthetic aluminosilicates and mixtures thereof.

The amount of abrasive included in the compositions is in the range of from about 3% to about 20% of the total composition by weight. Preferred compositions contain from about 5% to about 10% by weight of abrasive.

DETERGENCY BUILDER

The compositions of this invention contain from about 3% to about 20%, preferably from about 5% to about 15%, by weight of detergency builders either of the organic or inorganic types. Examples of water-soluble inorganic builders which can be used, alone or in admixture with themselves and organic alkaline sequestrant builder salts, are alkali metal carbonates, polyphosphates, and silicates. Specific examples of such salts are sodium tripolyphosphate, sodium carbonate, potassium carbonate, sodium pyrophosphate, potassium pyrophosphate, potassium tripolyphosphate, and sodium hexametaphosphate. Examples of organic builder salts which can be used alone, or in admixture with each other or with the preceding inorganic alkaline builder salts, are alkali metal polycarboxylates, e.g., water-soluble citrates such as sodium and potassium citrate, sodium and potassium tartrate, sodium and potassium ethylenediaminetetraacetate, sodium and potassium N-(2-hydroxyethyl)-ethylene diamine triacetates, sodium and potassium nitrilo triacetates (NTA) and sodium and potassium N-(2-hydroxyethyl)-nitrilo diacetates. Other organic builder salts include the alkali metal salts of

phytic acid, e.g., sodium phytate (see U.S. Patent 2,739,942). Water-soluble salts of ethane-1-hydroxy-1,1-diphosphonate (EHDP) are also suitable. Mixtures of any of the preceding water-soluble organic or inorganic builder salts can be used.

The compositions of this invention can contain insoluble builder salts selected from certain zeolites or aluminosilicates. One such aluminosilicate which is useful in the compositions of the invention is water-insoluble crystalline aluminosilicate ion exchange material of the formula:

$$Na_z[(AlO_2)_z \cdot (SiO_2)_y] \cdot xH_2O$$

wherein z and y are at least 6, the molar ratio of z to y is from 1.0 to 0.5 and x is from 10 to 264, said material having a particle size diameter of from about 0.1 micron to about 10 microns, a calcium ion exchange capacity of at least about 200 mg. $CaCO_3$eq./gram and a calcium ion exchange rate of at least about 2 grains Ca^{++}/gallon/ minute/gram. This ion exchange builder is more fully described in Gedge et al's French patent 2,237,839 published February 14, 1975, herein incorporated by reference. A preferred aluminosilicate of this type is Zeolite A.

A second water-insoluble aluminosilicate ion exchange material useful herein is water-insoluble amorphous hydrated aluminosilicate material of the emperical formula:

$$M_z(zAlO_2 \cdot ySiO_2)$$

wherein M is sodium, potassium, ammonium, or substituted ammonium, z is from about 0.5 to about 2, y is 1 and said material having a particle size diameter of less than 100 microns, a magnesium ion exchange capacity of at least about 50 milligrams equivalent of $CaCO_3$ hardness per gram of

anhydrous aluminosilicate and a Mg^{++} exchange rate of at least about 1 grain/gallon/minute/gram/gallon; and mixtures thereof. This ion exchange builder is more fully described in Belgian patent 814,874 issued on November 12, 1974 to Corkill et al, herein incorporated by reference.

Water

The compositions of this invention contain water, preferably in an amount of from about 40% to about 79% by weight.

Optional Ingredients

Alcohols, such as ethyl alcohol, and hydrotropes, such as sodium and potassium toluene sulfonate, sodium and potassium xylene sulfonate, trisodium sulfosuccinate and related compounds (as disclosed in U.S. Patent 3,915,903, incorporated herein by reference) and urea, can be utilized in the interests of achieving a desired product phase stability and viscosity. Also useful in the compositions of this invention are suspending or thickening agents such as those disclosed in U.S. Patent 3,393,153 incorporated herein by reference including colloidal silica having a mean particle diameter ranging from about 0.01 micron to about 0.05 micron and particulate polymers such as polystyrene, oxidized polystyrene having an acid number of from 20 to about 40, sulfonate polystyrene having an acid number of from about 10 to about 30, polyethylene, oxidized polyethylene having an acid number of from about 10 to about 30; sulfonated polyethylene having an acid number of from about 5 to about 25; polypropylene, oxidized polypropylene having an acid number of from about 10 to about 30 and sulfonated polypropylene having an acid number of from about 5 to about 25, all of said particulate polymers having mean particle diameters ranging from about 0.01 micron to about 30 microns. Other examples of suspending and thickening agents include copolymers of styrene with monomers such as maleic anhydride, nitrilonitrile, methacrylic acid and lower alkyl esters of methacrylic acid, copolymers

of styrene with methyl or ethyl acrylate, methyl or ethyl maleate, vinyl acetate, acrylic, maleic or fumaric acids and mixtures thereof. The mole ratio of ester and/or acid to styrene is preferably in the range from about 4 to about 40 styrene units per ester and/or acid unit. Such materials preferably have a mean particle diameter range of from about 0.05 micron to about 1 micron and molecular weights ranging from about 500,000 to about 2,000,000. Cellulosic polymers such as carboxymethyl cellulose and hydroxypropyl cellulose and gums such as guar gum and gum tragacanth are also suitable suspending and thickening agents.

The detergent compositions of this invention can contain, if desired, any of the usual adjuvants, diluents and additives, for example, perfumes, enzymes, dyes, antitarnishing agents, antimicrobial agents, and the like, without detracting from the advantageous properties of the compositions. Alkalinity sources and pH buffering agents such as alkali metal carbonates and bicarbonates, monoethanolamine, triethanolamine, alkali metal hydroxides, etc., can also be utilized. A preferred pH range for a 1% solution in water is from about 6 to about 11.

The following examples are given to illustrate the invention. All amounts and percentages in the specification and claims are by weight unless otherwise indicated.

EXAMPLE I

Liquid detergent compositions were prepared containing the ingredients listed below:

	A	B	C	D
Sodium C_{12-14} (coconut) alkyl sulfate	12.5% ——→			
Sodium C_{12-14} (coconut) ethoxy(3)alkyl sulfate	13.5 ——→			
C_{12-14} alkyl dimethyl amine oxide	4.0 ——→			
Quartz (75-150 microns)	-	10%	-	10%
Sodium Aluminosilicate (Zeolite A/1-10microns)	-	7.5	7.5	-

Sodium Citrate (anhydrous basis)	-	7.5	7.5	-
Sodium Xylene Sulfonate	2.5 →			
Potassium Chloride	0.8 →			
Ethanol	6.3 →			
Water and Misc.	Balance →			

Composition B within the scope of the invention containing both an abrasive and a detergency builder was compared to comparable compositions containing neither an abrasive nor a detergency builder (A), only detergency builders (C) and only an abrasive (D).

Aluminum strips were treated with oatmeal and egg food soils and baked to create typical, hard-to-remove soils.

The relative effort required to remove the soils after direct application or direct application plus a soak (0.2% product in water) using the compositions of the example was obtained by using a "Gardner Abrasion Machine" using a series of progressively heavier weights. The first ten strokes by the machine were made with a one-pound weight mounted over a holder with a sponge saturated with 0.2% product in water. The next ten strokes were made with a three-pound weight over the sponge and the final ten strokes were made with a six-pound weight. The percentage of soil removed after each ten stroke cycle was recorded.

Cleaning (% removed at 10/20/30 strokes)

<u>Oatmeal Soil</u>	A	B	C	D
Direct Application to Soil	3/27/83	20/80/98	15/50/92	11/58/97
Direct Application Plus 15 minute soak at 115°F	18/55/95	100 at 8 strokes	100 at 26 strokes	100 at 26 strokes
<u>Egg Soil</u>				
Direct Application to Soil	0/0/0	2/8/26	2/3/7	0/5/10

The data demonstrates a substantial advantage for Composition B within the scope of the invention which contains both a detergency builder and an abrasive.

EXAMPLE II

The following composition was prepared:

Sodium C_{12-14} (coconut) alkyl sulfate	11.5%
Sodium C_{12-14} (coconut) alkyl ethoxy(3) sulfate	12.5
C_{12-14} alkyl dimethyl	4.0
Sodium aluminosilicate (Zeolite A/ 1-10 microns)	5.0
Sodium citrate	2.0
Silica abrasive (synthetic amorphous/ 45-105 microns)	5.0
Sodium sulfosuccinate	2.0
$KH\ CO_3$	1.14
K_2CO_3	1.86
Fumed Silica (Cab-O-Sil M-5)	1.5
Ethanol	4.3
Water & miscellaneous	

Cleaning results comparable to Composition B of Example I are obtained.

Sodium C_{12-13} alkylbenzene sulfonate is substituted for the sodium C_{12-14} (coconut) alkyl sulfate. Comparable cleaning results are obtained.

C_{12} monoethanol amide is substituted for the C_{14-16} alkyl dimethyl amine oxide. Comparable cleaning results are obtained.

Feldspar, high density perlite, calcite and pumice respectively are substituted for the silica abrasive. Comparable cleaning results are obtained.

Potassium pyrophosphate is substituted for the sodium aluminosilicate. Comparable cleaning results are obtained.

CLAIMS :

1. A liquid detergent composition comprising by weight:

a) from about 15% to about 50% of a high sudsing surfactant selected from the group consisting of anionic, nonionic, ampholytic and zwitterionic surfactants and mixtures thereof;

b) from about 3% to about 20% of a detergency builder selected from the group consisting of water-soluble polyphosphates, water-soluble organic carboxylates; water-soluble phosphonates; alkali metal silicates; alkali metal carbonates; water-insoluble crystalline aluminosilicate ion exchange material of the formula:

$$Na_z[(AlO_2)_z(SiO_2)_y]\cdot xH_2O$$

wherein z and y are at least 6, the molar ratio of z to y is from 1.0 to 0.5 and x is from 10 to 264, said material having a particle size diameter of from about 0.1 micron to about 10 microns, a calcium ion exchange capacity of at least about 200 mg. $CaCO_3$ eq./gram and a calcium ion exchange rate of at least about 2 grains Ca^{++}/gallon/minute/ gram; water-insoluble amorphous hydrated aluminosilicate material of the empirical formula:

$$M_z(zAlO_2.ySiO_2)$$

wherein M is sodium, potassium, ammonium, or substituted ammonium, z is from about 0.5 to about 2, y is 1 and said material having a particle size diameter of less than 100 microns, a magnesium ion exchange capacity of at least about 50 milligrams equivalent of $CaCO_3$ hardness per gram of anhydrous aluminosilicate and a Mg^{++} exchange rate of at least about 1 grain/gallon/minute/gram/gallon; and mixtures thereof;

c) from about 3% to about 20% of a water-insoluble abrasive having a particle diameter of from about 1 to about 150 microns and a hardness on the Mohs scale of from about 2 to about 7; and

d) the balance water;

said compositions providing an initial suds cover to a dishwashing solution and a suds cover after the washing of eight plates when used at a concentration of 0.07% in 2 gallons of 115°F. water containing 7 grains/gallon water hardness measured as $CaCO_3$ each plate carrying 4.0 ml. of triglyceride containing soil.

2. The composition of Claim 1 wherein the high-sudsing surfactant comprises an anionic surfactant.

3. The composition of Claim 2 wherein the anionic surfactant is selected from the group consisting of alkyl sulfates, alkyl ether sulfates, alkylbenzene sulfonates, paraffin sulfonates, olefin sulfonates and mixtures thereof.

4. The composition of Claim 3 which comprises a nonionic surfactant selected from the group consisting of ethanolamides and amine oxides.

5. The compositions of Claims 1, 2, 3 or 4 wherein the detergency builder comprises a material selected from the group consisting of alkali metal polyphosphates, water-soluble polycarboxylates, sodium aluminosilicates and mixtures thereof.

6. The compositions of Claims 1, 2, 3 or 4 wherein the abrasive comprises a material selected from the group consisting of quartz, silica, feldspar, high density perlite, calcite and mixtures thereof.

7. The compositions of Claims 1, 2, 3 or 4 wherein the amount of surfactant is from about 25% to about 35% by weight.

8. The compositions of Claim 5, wherein the amount of detergency builder is from about 5 to about 15% by weight.

9. The compositions of Claim 6 wherein the amount of said abrasive is from about 5% to about 10% and the particle diameter of said abrasive is from about 20 to about 100 microns.

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 79 20 0802

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.³)
X	GB - A - 1 534 680 (COLGATE-PALMOLIVE) * claims 1 to 3, 4, 7; page 3, lines 1 to 12 *	1-3, 5,6,8, 9	C 11 D 3/14 C 11 D 1/86 C 11 D 3/08
D	US - A - 3 813 349 (PROCTER & GAMBLE) * claims 1 and 2; column 4, lines 60 to 73 *	1-6, 8,9	
D	US - A - 3 623 990 (PROCTER & GAMBLE) * claims 1, 2, 7 *	1-3, 5,6, 8,9	TECHNICAL FIELDS SEARCHED (Int.Cl.³)
A	GB - A - 1 481 685 (UNILEVER) * complete document *		C 11 D 1/00 C 11 D 3/00
A	DE - A1 - 2 516 003 (PROCTER & GAMBLE) * complete document *		

CATEGORY OF CITED DOCUMENTS

- X: particularly relevant
- A: technological background
- O: non-written disclosure
- P: intermediate document
- T: theory or principle underlying the invention
- E: conflicting application
- D: document cited in the application
- L: citation for other reasons
- &: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	02-04-1980	SCHULTZE